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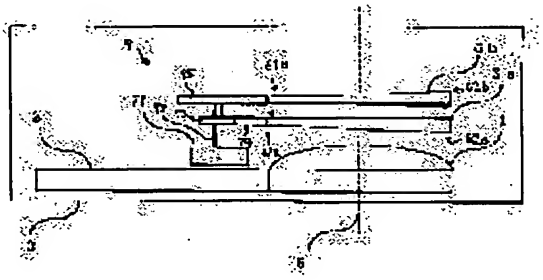
(54) COLLISION PREVENTING RADAR WITH SCANNING FUNCTION

(57)Abstract:
PROBLEM TO BE SOLVED: To provide a collision preventing radar in a simple structure capable of increasing its scanning speed.
SOLUTION: A radar transmits an electric wave from a transmission and receiving antenna 1 mounted on a moving body and receives its reflected wave to detect a distance from and a relative speed to an obstacle from a delay time for the electric wave and a Doppler shift component. In this case, the direction of the transmission and receiving antenna 1 is fixed toward the moving body to be moved, at least two dielectric discs 6a, 6b different in thickness with a circumferential angle are arranged overlapping each other in front of the transmission and receiving antenna 1 and a scanning means is provided to scan the electric wave to the side of the moving body to be moved with the rotation of the dielectric discs 6a, 6b.



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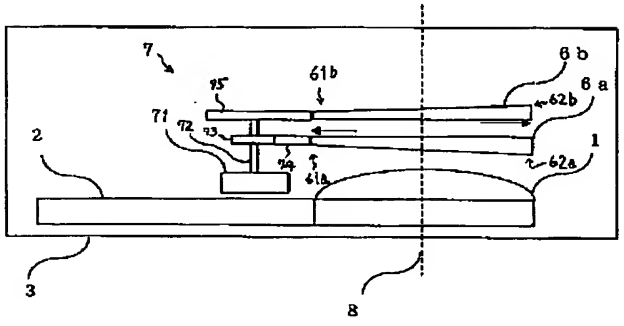
(54) 【発明の名称】走査機能付き衝突防止レーダ

(57) 【要約】

【課題】　構成が簡素で、走査速度が高速にできる衝突防止レーダを提供する。

【解決手段】　移動体に搭載した送受信アンテナ１より電波を送信してその反射波を受信し、この電波の遅延時間及びドップラシフト成分から障害物との距離及び相対速度を検知する衝突防止レーダにおいて、上記送受信アンテナ１の向きを移動体進行方向に向けて固定し、この送受信アンテナ１の前方に円周角によって厚さが異なる誘電体円盤６ａ，６ｂを少なくとも２つ重ねて配置し、これらの誘電体円盤６ａ，６ｂを回転させることにより、上記電波を移動体進行方向の側方に走査させる走査手段を設けた。



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【特許請求の範囲】

【請求項１】　移動体に搭載した送受信アンテナより電波を送信してその反射波を受信し、この電波の遅延時間及びドップラシフト成分から障害物との距離及び相対速度を検知する衝突防止レーダにおいて、上記送受信アンテナの向きを移動体進行方向に向けて固定し、この送受信アンテナの前方に円周角によって厚さが異なる誘電体円盤を少なくとも２つ重ねて配置し、これらの誘電体円盤を回転させることにより、上記電波を移動体進行方向の側方に走査させる走査手段を設けたことを特徴とする走査機能付き衝突防止レーダ。

【請求項２】　上記誘電体円盤は、この誘電体円盤の中心軸を挟んで最薄部と最厚部とが互いに反対側に位置するよう径に沿って一定に厚さが変化することを特徴とする請求項１記載の走査機能付き衝突防止レーダ。

【請求項３】　上記走査手段は、上記誘電体円盤を毎秒１０回転以上、回転させることを特徴とする請求項１又は２記載の走査機能付き衝突防止レーダ。

【請求項４】　上記誘電体円盤の回転は、一方の誘電体円盤の最薄部に他方の誘電体円盤の最薄部が重なる位相と、一方の誘電体円盤の最薄部に他方の誘電体円盤の最厚部が重なる位相とを有することを特徴とする請求項１～３のいずれか記載の走査機能付き衝突防止レーダ。

【発明の詳細な説明】

【０００１】

【発明の属する技術分野】本発明は、障害物との距離及び相対速度を検知する衝突防止レーダに係り、特に、構成が簡素で、走査速度が高速にできる衝突防止レーダに関するものである。

【０００２】

【従来の技術】従来、移動体よりその進行方向に向けて特定の電波を送信し、進行方向に存在する先行の移動体（先行車両）や障害物との距離及び相対速度をその反射波により獲得し、この情報に基づいて警告表示や警報を発し、乗員の注意を喚起させることにより移動体の進行における安全性を確保・向上させるものがあった。

【０００３】このような衝突防止レーダとして、主にミリ波帯を使用したレーダ技術の適用範囲であることから、先行車両との距離や相対速度を得る原理として、既存の各種レーダ方式（例えば、ＦＭ－ＣＷ、パルス、２周波ＣＷ、スペクトラム拡散方式等）を用いたものが知られている。

【０００４】このような衝突防止レーダは、先行車両がカーブを走行しているなどにより、自移動体（自車両）の前方直線上（進行方向）に存在しない場合でも、先行移動体に向けて電波を放射し、その反射波を受信しなければならない。そのためには電波の放射方向を左右に走査させる必要がある。

【０００５】図４に従来の衝突防止レーダを示す。従来の衝突防止レーダでは、信号処理部４からの信号がレーダ装置ミリ波部２を介して送受信アンテナ１に送られる。送受信アンテナ１により空中に放射されたミリ波が先行車両で反射されて送受信アンテナ１に戻り、受信される。この受信ミリ波からレーダ装置ミリ波部２にてビート信号が検出され、信号処理部４では先行車両との距離や相対速度が検出される。通常、送受信アンテナ１とレーダ装置ミリ波部２とは防水・防塵のため筐体３の内部に格納されている。

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【０００６】駆動部５は、筐体３を左右に駆動し、ミリ波の放射方向を左右に走査する。また、駆動部５を自車両の運転ハンドルと連動させて筐体３を駆動する場合もある。

【０００７】

【発明が解決しようとする課題】従来の衝突防止レーダには、次のような問題があった。

【０００８】レーダ装置全体（筐体）を左右に往復させるために大型のモータが必要になり、その結果、装置が大型化し車両に取り付けるのに適さなくなる。また、このように大型化したものは、走査速度に限界がある。また、フェーズドアレイを用いる方式は位相制御が面倒であると共に、高価格になる。

【０００９】そこで、本発明の目的は、上記課題を解決し、構成が簡素で、走査速度が高速にできる衝突防止レーダを提供することにある。

【００１０】

【課題を解決するための手段】上記目的を達成するために本発明は、移動体に搭載した送受信アンテナより電波を送信してその反射波を受信し、この電波の遅延時間及びドップラシフト成分から障害物との距離及び相対速度を検知する衝突防止レーダにおいて、上記送受信アンテナの向きを移動体進行方向に向けて固定し、この送受信アンテナの前方に円周角によって厚さが異なる誘電体円盤を少なくとも２つ重ねて配置し、これらの誘電体円盤を回転させることにより、上記電波を移動体進行方向の側方に走査させる走査手段を設けたものである。

【００１１】上記誘電体円盤は、この誘電体円盤の中心軸を挟んで最薄部と最厚部とが互いに反対側に位置するよう径に沿って一定に厚さが変化してもよい。

【００１２】上記走査手段は、上記誘電体円盤を毎秒１０回転以上、回転させてもよい。

【００１３】上記誘電体円盤の回転は、一方の誘電体円盤の最薄部に他方の誘電体円盤の最薄部が重なる位相と、一方の誘電体円盤の最薄部に他方の誘電体円盤の最厚部が重なる位相とを有してもよい。

【００１４】

【発明の実施の形態】以下、本発明の一実施形態を添付図面に基づいて詳述する。

【００１５】図１，図２に示されるように、本発明の衝突防止レーダは、電波を放射・入射する送受信アンテナ１と、その送受信アンテナ１を介して電波を送受信する

レーダ装置ミリ波部２と、電波を屈折させる２つの誘電体円盤６ａ，６ｂと、これらの誘電体円盤６ａ，６ｂを回転させる駆動機構７とが筐体３の内部に格納されている。筐体３には図示されない外部端子が設けられており、この外部端子は信号処理部４（図４参照）に接続されている。

【００１６】送受信アンテナ１は、電波の放射方向が一方向に向いているものであり、以下、送受信アンテナ１の向きとは電波の放射方向のことである。図１のものでは電波の放射方向は図の上になる。筐体３は移動体に固定的に取り付けるようになっており、そのとき送受信アンテナ１の向きを移動体進行方向に向けて固定することになる。レーダ装置全体の小型化を考慮すると、送受信アンテナ１は誘電体レンズアンテナ、パッチアンテナのような薄型のアンテナが好ましい。

【００１７】誘電体円盤６ａ，６ｂは、その中心軸８の方向が送受信アンテナ１の向きになるよう送受信アンテナ１の前方に重ねて配置されている。送受信アンテナ１に近く配置されたものを前段誘電体円盤６ａと呼び、送受信アンテナ１から遠く配置されたものを後段誘電体円盤６ｂと呼ぶことにする。それぞれの誘電体円盤６ａ，６ｂは、厚さが半回転周期で増減を繰り返すよう、その円周に沿って厚さを変化させたものである。この実施形態では、図示されるように、誘電体円盤６ａ，６ｂは、中心軸８を挟んで最薄部６１ａ，６１ｂと最厚部６２ａ，６２ｂとが互いに反対側に位置するよう径に沿って一定に厚さが変化している。前段誘電体円盤６ａ及び後段誘電体円盤６ｂは、それぞれ中心軸８の回りに回転自在に設けられている。

【００１８】誘電体円盤６ａ，６ｂの厚さは、後述する走査角度と誘電体の屈折率とによって決定されるものである。例えば、中心軸８に対する左右の走査角度を３０度、誘電体の屈折率を１．６とすると、１個の誘電体円盤の最薄部と最厚部との厚さの差は約３５ｍｍになる。

【００１９】駆動機構７は、誘電体円盤６ａ，６ｂを回転させることにより、電波を移動体進行方向の側方に走査させる走査手段を構成するものである。本実施形態では、駆動機構７は、駆動モータ７１の回転軸７２に伝達用円盤を取り付けたものである。前段誘電体円盤６ａのための伝達用円盤は、駆動モータ７１の回転軸７２に同軸に取り付けた第一伝達用円盤７３と、この第一伝達用円盤７３に外周を接するように配置した第二伝達用円盤７４とからなり、前段誘電体円盤６ａは第二伝達用円盤７４に外周を接する。後段誘電体円盤６ｂのための伝達用円盤は、駆動モータ７１の回転軸７２に同軸に取り付けた単一の大径伝達用円盤７５からなり、後段誘電体円盤６ｂは大径伝達用円盤７５に外周を接する。このような駆動機構７の構成により、駆動モータ７１が回転するとき、前段誘電体円盤６ａ及び後段誘電体円盤６ｂは中心軸８を中心に回転する。前段誘電体円盤６ａは第一伝達用円盤７３の回転が第二伝達用円盤７４を介して伝わるので、駆動モータ７１の回転と同方向に回転し、回転角度は第一伝達用円盤７３との外周長比で決まる。後段誘電体円盤６ｂは大径伝達用円盤７５の回転が伝わるので、駆動モータ７１の回転と逆方向に回転し、回転角度は大径伝達用円盤７５との外周長比で決まる。誘電体円盤６ａ，６ｂの回転速度は、衝突防止レーダの観測範囲において、０．１秒以上先行車両の検知が不可能になることを防ぐため、毎秒１０回転以上が望ましい。

【００２０】さて、本発明の衝突防止レーダにあっては、信号処理部４からの信号がレーダ装置ミリ波部２を介して送受信アンテナ１に送られる。送受信アンテナ１により放射されたミリ波が前段誘電体円盤６ａ及び後段誘電体円盤６ｂを通過して空中に放射される。空中に放射されたミリ波が先行車両で反射されて送受信アンテナ１に戻り、受信される。この受信ミリ波からレーダ装置ミリ波部２にてビート信号が検出される。信号処理部４では、ビート信号により電波の遅延時間及びドップラシフト成分が求められ、電波の遅延時間及びドップラシフト成分から先行車両との距離や相対速度が検出される。

【００２１】続いて、本発明による走査手段の動作を説明する。図３は走査方式の原理図である。まず、前段誘電体円盤６ａ及び後段誘電体円盤６ｂがともに存在しない場合を考えると、送受信アンテナ１により放射されたミリ波は送受信アンテナ１の開口面に並行な波面を持つ平面波となる。しかし、前段誘電体円盤６ａが存在すると、屈折作用により平面波の指向方向が曲げられる。前段誘電体円盤６ａは回転しているので、平面波の指向方向は回転角に応じて変化する。さらに、後段誘電体円盤６ｂが存在すると、ここでも屈折作用により平面波の指向方向が曲げられる。従って、筐体３より放射されるミリ波は前段誘電体円盤６ａ及び後段誘電体円盤６ｂによる屈折作用を受けたものとなる。

【００２２】図３（ａ）、図３（ｂ）、図３（ｃ）は、周期的に変化する前段誘電体円盤６ａ及び後段誘電体円盤６ｂの位置関係（位相という）を示したものである。図３（ａ）は、前段誘電体円盤６ａの最薄部６１ａに後段誘電体円盤６ｂの最薄部６１ｂが重なる位相であり、かつこれらの最薄部６１ａ，６１ｂが送受信アンテナ１の一側（図の左）にある位相である。図３（ｂ）は、前段誘電体円盤６ａの最薄部６１ａに後段誘電体円盤６ｂの最厚部６２ｂが重なる位相である。図３（ｃ）は、前段誘電体円盤６ａの最薄部６１ａに後段誘電体円盤６ｂの最薄部６１ｂが重なる位相であり、かつこれらの最薄部６１ａ，６１ｂが送受信アンテナ１の上記とは反対側（図の右）にある位相である。

【００２３】図３（ａ）の位相では、送受信アンテナ１により放射されたミリ波は前段誘電体円盤６ａを通過する際に最厚部６２ａのある右側へ曲げられ、後段誘電体円盤６ｂを通過する際にさらに最厚部６２ｂのある右側

へ曲げられることになり、その結果、右側へ放射される。図３（ｂ）の位相では、送受信アンテナ１により放射されたミリ波は前段誘電体円盤６ａを通過する際に最厚部６２ａのある右側へ曲げられるが、後段誘電体円盤６ｂを通過する際に今度は最厚部６２ｂのある左側へ曲げられることになり、曲げが相殺されて、元の送受信アンテナ１の放射方向に放射される。図３（ｃ）の位相では、図３（ａ）の位相とは丁度逆のことが起り、ミリ波は左側へ放射される。

【００２４】以上の周期的変化を行うことにより、送受信アンテナ１から移動体進行方向に向けて放射された電波を、移動体進行方向の側方に走査させることができる。従って、先行車両がカーブを走行しているなどで自車両の前方直線上に位置していなくても、先行車両に向けてミリ波を放射し、先行車両からの反射波を受信することが可能となる。

【００２５】上記の周期的変化の速度は、前段誘電体円盤６ａ及び後段誘電体円盤６ｂの回転速度の制御により任意に設定でき、容易に高速化できる。また、駆動モータ７１は前段誘電体円盤６ａ及び後段誘電体円盤６ｂを回転させるだけであるから、レーダ装置全体を駆動させる従来技術と比較して小型にすることが可能となる。また、前段誘電体円盤６ａ及び後段誘電体円盤６ｂの厚さは薄いので、本発明の衝突防止レーダは十分小型となる。

【００２６】なお、本実施形態では、一方の誘電体円盤

のための伝達用円盤を１枚多くすることにより双方の誘電体円盤を互いに逆方向に回転させているが、双方の誘電体円盤を同方向に回転させても、走査は可能である。

【００２７】

【発明の効果】本発明は次の如き優れた効果を発揮する。

【００２８】（１）２個の誘電体円盤を送受信アンテナの前方て回転させるという簡素な構成で走査を行うことができ、その走査速度が高速にできる。

【００２９】（２）薄型・小型になるので、自動車への搭載に適している。

【図面の簡単な説明】

【図１】本発明の一実施形態を示す衝突防止レーダの構成図である。

【図２】本発明の衝突防止レーダの走査手段部分の斜視図である。

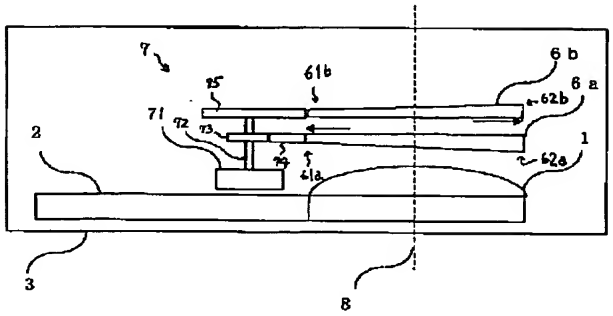
【図３】本発明の衝突防止レーダの走査手段の動作説明図である。

【図４】従来技術の衝突防止レーダのブロック図である。

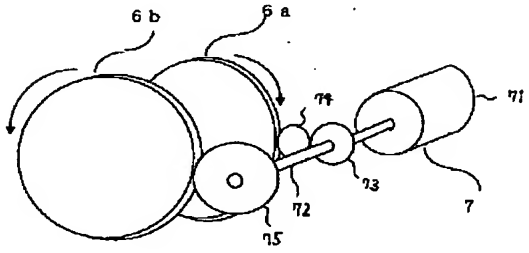
【符号の説明】

１　送受信アンテナ
６ａ　前段誘電体円盤
６ｂ　後段誘電体円盤
７　　駆動機構

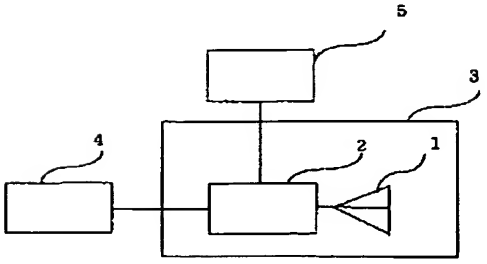
【図１】



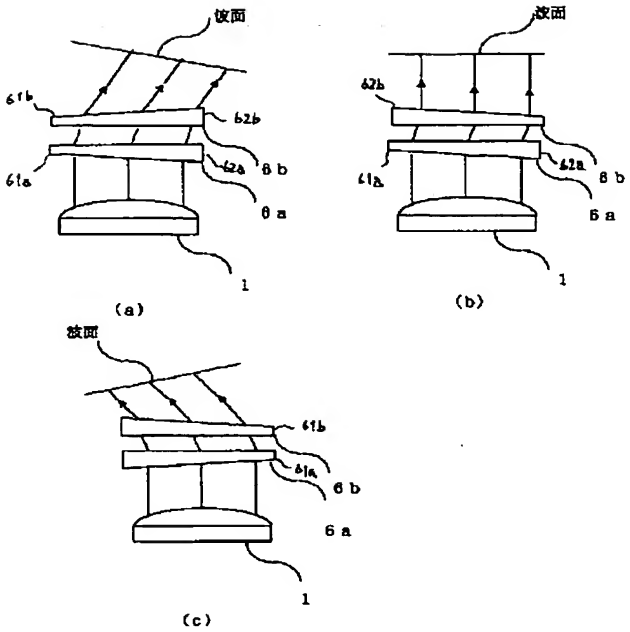
【図２】



【図４】



【図３】


波面
61b
62b
62a
6 b
61a
6 a
1
(a)
波面
62b
62a
6 b
61a
6 a
1
(b)
波面
61b
61a
6 b
6 a
1
(c)

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[Translation done.]

* NOTICES *

Epitome

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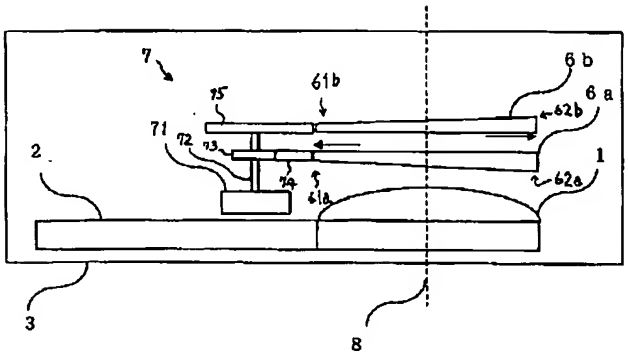
(57) [Abstract]
[Technical problem] A configuration is simple and the collision-prevention radar as for which a scan speed is made to a high speed is offered.
[Means for Solution] From the transceiver antenna 1 carried in the mobile, an electric wave is transmitted and that reflected wave is received, and in the collision-prevention radar which detects distance and relative velocity with an obstruction from the time delay and doppler shift component of this electric wave, the sense of the above-mentioned transceiver antenna 1 is turned to a mobile travelling direction, and it fixes, and is the angle of circumference to the front of this transceiver antenna 1. A scan means to make the side of a mobile travelling direction scan the above-mentioned electric wave was established by arranging in piles at least two dielectric disks 6a and 6b by which thickness differs, and rotating these dielectric disks 6a and 6b.

[Translation done.]



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CLAIMS

[Claim(s)]

[Claim 1] In the collision-prevention radar which transmits an electric wave, receives that reflected wave, and detects distance and relative velocity with an obstruction from the time delay and doppler shift component of this electric wave from the transceiver antenna carried in the mobile By turning the sense of the above-mentioned transceiver antenna to a mobile travelling direction, fixing, arranging in piles at least two dielectric disks from which thickness differs with the angle of circumference ahead of this transceiver antenna, and rotating these dielectric disks The collision-prevention radar with a scan function characterized by establishing a scan means to make the side of a mobile travelling direction scan the above-mentioned electric wave.

[Claim 2] The above-mentioned dielectric disk is a collision-prevention radar with a scan function according to claim 1 characterized by thickness changing uniformly along with a path so that the thinest part and ****** may be mutually located in the opposite side on both sides of

the medial axis of this dielectric disk.
[Claim 3] The above-mentioned scan means is a collision-prevention radar with a scan function according to claim 1 or 2 characterized by rotating the above-mentioned dielectric disk per second ten or more revolutions.
[Claim 4] For rotation of the above-mentioned dielectric disk, claims 1-3 characterized by having the phase to which the thinest part of the dielectric disk of another side laps with the thinest part of one dielectric disk, and the phase to which ****** of the dielectric disk of another side laps with the thinest part of one dielectric disk are the collision-prevention radars with a scan function of a publication either.

[Translation done.]

* NOTICES *

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to the collision-prevention radar which detects distance and relative velocity with an obstruction, and especially, its configuration is simple and it relates to the collision-prevention radar as for which a scan speed is made to a high speed.
[0002]
[Description of the Prior Art] Conventionally, the specific electric wave was transmitted towards that travelling direction from the mobile, the mobile (precedence car), the distance with an obstruction, and relative velocity of the precedence which exists in a travelling direction were gained by that reflected wave, the alarm display and the alarm were emitted based on this information, and there were some which secure and raise the safety in advance of a mobile by making crew's attention call.

[0003] Since it is the applicability of the radar technique which mainly used the millimeter wave band as such a collision-prevention radar, the thing using the various existing radar system (for example, FM-CW, a pulse, the 2 cycle CW, a spectrum diffusion method, etc.) is known as a principle which obtains distance and relative velocity with a precedence car.

[0004] Even when a precedence car does not exist on a before [a self-mobile (self-car)] Katanao line (travelling direction) by running the curve etc., such a collision-prevention radar must emit an electric wave towards a precedence mobile, and must receive the reflected wave. It is necessary to make right and left scan the radiation direction of an electric wave for that purpose.

[0005] The conventional collision-prevention radar is shown in drawing 4 . By the conventional collision-prevention radar, the signal from the signal-processing section 4 is sent to the transceiver antenna 1 through the radar equipment millimeter wave section 2. It is reflected by the precedence car, and the millimeter wave emitted in the air by the transceiver antenna 1 returns to the transceiver antenna 1, and is received. A beat signal is detected in the radar equipment millimeter wave section 2 from this received millimeter wave, and distance and relative velocity with a precedence car are detected in the signal-processing section 4. Usually, the transceiver antenna 1 and the radar equipment millimeter wave section 2 are stored in the interior of a case 3 for waterproofing and protection against dust.

[0006] A mechanical component 5 drives a case 3 right and left, and scans the radiation direction of a millimeter wave right and left. Moreover, a mechanical component 5 may be interlocked with the handle of a self-car, and a case 3 may be driven.

[0007]

[Problem(s) to be Solved by the Invention] There were the following problems in the conventional collision-prevention radar.

[0008] It stops being suitable for a large-sized motor being needed in order to make right and left go and come back to the whole (case) radar installation, consequently equipment being enlarged, and attaching in a car. Moreover, some which were enlarged in this way have a limitation in a scan speed. Moreover, it becomes an expensive rank while the method using a phased array has troublesome phase control.

[0009] Then, the purpose of this invention solves the above-mentioned technical problem, and its configuration is simple, and it is to offer the collision-prevention radar as for which a scan speed is made to a high speed.

[0010]
[Means for Solving the Problem] In order to attain the above-mentioned purpose, from the transceiver antenna carried in the mobile, this invention transmits an electric wave and receives the reflected wave. In the collision-prevention radar which detects distance and relative velocity with an obstruction from the time delay and doppler shift component of this electric wave By turning the sense of the above-mentioned transceiver antenna to a mobile travelling direction, fixing, arranging in piles at least two dielectric disks from which thickness differs with the angle of circumference ahead of this transceiver antenna, and rotating these dielectric disks A scan means to make the side of a mobile travelling direction scan the above-mentioned electric wave is established.
[0011] Along with a path, as for the above-mentioned dielectric disk, thickness may change uniformly so that the thinest part and ****** may be mutually located in the opposite side on both sides of the medial axis of this dielectric disk.
[0012] The above-mentioned scan means may rotate the above-mentioned dielectric disk per second ten or more revolutions.
[0013] Rotation of the above-mentioned dielectric disk may have the phase to which the thinest part of the dielectric disk of another side laps with the thinest part of one dielectric disk, and the phase to which ****** of the dielectric disk of another side laps with the thinest part of one dielectric disk.
[0014]
[Embodiment of the Invention] Hereafter, 1 operation gestalt of this invention is explained in full detail based on an accompanying drawing.
[0015] As shown in drawing 1 and drawing 2 , the radar equipment millimeter wave section 2 in which the collision-prevention radar of this invention transmits and receives an electric wave for an electric wave through radiation, the transceiver antenna 1 which carries out incidence, and its transceiver antenna 1, two dielectric disks 6a and 6b which make an electric wave refracted, and the drive 7 made to rotate these dielectric disks 6a and 6b are stored in the interior of a case 3. The external terminal which is not illustrated is prepared in the case 3, and this external terminal is connected to the signal-processing section 4 (refer to drawing 4).
[0016] The radiation direction of an electric wave has turned [antenna / 1 / transceiver] to the one direction, and the sense of the transceiver antenna 1 is [the following and] the radiation direction of an electric wave. In the thing of drawing 1 , the radiation direction

of an electric wave comes on drawing. A case 3 is attached in a mobile fixed, will turn the sense of the transceiver antenna 1 to a mobile travelling direction then, and will be fixed. When the miniaturization of the whole radar installation is taken into consideration, a thin antenna like a dielectric lens antenna and a patch antenna of the transceiver antenna 1 is desirable.

[0017] The dielectric disks 6a and 6b are arranged in piles ahead of the transceiver antenna 1 so that the direction of the medial axis 8 may become the sense of the transceiver antenna 1. What has been arranged in that by which arrangement was carried out soon distantly [antenna / 1 / preceding paragraph dielectric disk 6a, a call, and / transceiver] will be called latter-part dielectric disk 6b to the transceiver antenna 1. Each dielectric disk 6a and 6b changes thickness in accordance with the periphery so that thickness may repeat increase and decrease a half-rotation period. With this operation gestalt, along with a path, as for the dielectric disks 6a and 6b, thickness is changing uniformly so that it may be illustrated, and the thinest parts 61a and 61b and ****** 62a and 62b may be mutually located in the opposite side on both sides of a medial axis 8. Preceding paragraph dielectric disk 6a and latter-part dielectric disk 6b are prepared in the surroundings of a medial axis 8 free [rotation], respectively.

[0018] The thickness of the dielectric disks 6a and 6b is determined by the scan include angle mentioned later and the refractive index of a dielectric. For example, if the refractive index of a dielectric is set to 1.6 for the scan include angle of the right and left to a medial axis 8 30 degrees, the difference of the thickness of the thinest part of one dielectric disk and ****** will be set to about 35mm.

[0019] A drive 7 constitutes a scan means to make the side of a mobile travelling direction scan an electric wave, by rotating the dielectric disks 6a and 6b. With this operation gestalt, a drive 7 attaches the disk for transfer in the revolving shaft 72 of a drive motor 71. The disk for transfer for preceding paragraph dielectric disk 6a consists of a disk 73 for the first transfer attached in the same axle at the revolving shaft 72 of a drive motor 71, and a disk 74 for the second transfer arranged so that this disk 73 for the first transfer may be touched in a periphery, and preceding paragraph dielectric disk 6a touches the disk 74 for the second transfer in a periphery. The disk for transfer for latter-part dielectric disk 6b becomes the revolving shaft 72 of a drive motor 71 from the single disk 75 for major-diameter transfer attached in the same axle, and latter-part dielectric disk 6b touches the disk 75 for major-diameter transfer in a periphery. When a

drive motor 71 rotates by the configuration of such a drive 7, preceding paragraph dielectric disk 6a and latter-part dielectric disk 6b rotate focusing on a medial axis 8. Since rotation of the disk 73 for the first transfer is transmitted through the disk 74 for the second transfer, preceding paragraph dielectric disk 6a rotates in rotation of a drive motor 71 and this direction, and angle of rotation is decided by the periphery length ratio with the disk 73 for the first transfer. Since rotation of the disk 75 for major-diameter transfer is transmitted, latter-part dielectric disk 6b rotates to rotation of a drive motor 71 and hard flow, and angle of rotation is decided by the periphery length ratio with the disk 75 for major-diameter transfer. In the observation range of a collision-prevention radar, in order for the rotational speed of the dielectric disks 6a and 6b to prevent detection of a precedence car becoming impossible 0.1 seconds or more, its per second ten or more revolutions are desirable.

[0020] Now, if it is in the collision-prevention radar of this invention, the signal from the signal-processing section 4 is sent to the transceiver antenna 1 through the radar equipment millimeter wave section 2. The millimeter wave emitted by the transceiver antenna 1 passes preceding paragraph dielectric disk 6a and latter-part dielectric disk 6b, and is emitted in the air. It is reflected by the precedence car, and the millimeter wave emitted in the air returns to the transceiver antenna 1, and is received. A beat signal is detected in the radar equipment millimeter wave section 2 from this received millimeter wave. In the signal-processing section 4, the time delay and doppler shift component of an electric wave are called for by the beat signal, and distance and relative velocity with a precedence car are detected from the time delay and doppler shift component of an electric wave.

[0021] Then, actuation of the scan means by this invention is explained. Drawing 3 is the principle Fig. of a scanning mode. First, considering the case where neither preceding paragraph dielectric disk 6a nor latter-part dielectric disk 6b exists, the millimeter wave emitted by the transceiver antenna 1 turns into a plane wave with a wave front parallel to the effective area of the transceiver antenna 1. However, existence of preceding paragraph dielectric disk 6a bends the orientation of a plane wave according to a refraction operation. Since preceding paragraph dielectric disk 6a is rotating, the orientation of a plane wave changes according to an angle of rotation. Furthermore, existence of latter-part dielectric disk 6b bends the orientation of a plane wave according to a refraction operation also here. Therefore, the millimeter wave emitted from a case 3 becomes what received the

refraction operation by preceding paragraph dielectric disk 6a and latter-part dielectric disk 6b.

[0022] Drawing 3 (a), drawing 3 (b), and drawing 3 (c) show the physical relationship (it is called a phase) of preceding paragraph dielectric disk 6a which changes periodically, and latter-part dielectric disk 6b. Drawing 3 (a) is a phase to which thinest part 61of latter-part dielectric disk 6b b laps with thinest part 61of preceding paragraph dielectric disk 6a a, and is a phase which has these thinest parts 61a and 61b in the 1 side (left of drawing) of the transceiver antenna 1. Drawing 3 (b) is a phase to which ****** 62of latter-part dielectric disk 6b b laps with thinest part 61of preceding paragraph dielectric disk 6a a. Drawing 3 (c) is a phase to which thinest part 61of latter-part dielectric disk 6b b laps with thinest part 61of preceding paragraph dielectric disk 6a a, and it is the phase to which these thinest parts 61a and 61b have the above of the transceiver antenna 1 in the opposite side (right of drawing).

[0023] In the phase of drawing 3 (a), in case the millimeter wave emitted by the transceiver antenna 1 passes preceding paragraph dielectric disk 6a, it is bent to right-hand side with ****** 62a, in case it passes latter-part dielectric disk 6b, it will be bent to the right-hand side which has ****** 62b further, consequently it is emitted to right-hand side. In the phase of drawing 3 (b), in case preceding paragraph dielectric disk 6a is passed, it is bent to right-hand side with ****** 62a, but in case the millimeter wave emitted by the transceiver antenna 1 passes latter-part dielectric disk 6b, shortly, it will be bent to left-hand side with ****** 62b, bending is offset, and it is emitted in the radiation direction of the original transceiver antenna 1. In the phase of drawing 3 (c), it happens that it is contrary to the phase of drawing 3 (a) exactly, and a millimeter wave is emitted to left-hand side.

[0024] The side of a mobile travelling direction can be made to scan the electric wave emitted towards the mobile travelling direction from the transceiver antenna 1 by performing the above periodic change. Therefore, even if not located on a before [a self-car] Katanao line to the precedence car running the curve etc., a millimeter wave is emitted towards a precedence car and it becomes possible to receive the reflected wave from a precedence car.

[0025] The rate of the above-mentioned periodic change can be set as arbitration by control of the rotational speed of preceding paragraph dielectric disk 6a and latter-part dielectric disk 6b, and can be accelerated easily. Moreover, since a drive motor 71 only rotates

preceding paragraph dielectric disk 6a and latter-part dielectric disk 6b, it becomes possible [making it small as compared with the conventional technique of making the whole radar installation driving]. Moreover, since the thickness of preceding paragraph dielectric disk 6a and latter-part dielectric disk 6b is thin, the collision-prevention radar of this invention becomes sufficiently small.

[0026] In addition, although hard flow is made to rotate both dielectric disks mutually with this operation gestalt by making [many] the disk for transfer for one dielectric disk one sheet, the scan is possible even if it rotates both dielectric disks in this direction.

[0027]

[Effect of the Invention] This invention demonstrates the outstanding effectiveness like a degree.

[0028] (1) It can scan with the simple configuration that a transceiver antenna carries out front ****** of the two dielectric disks, and the scan speed is made to a high speed.

[0029] (2) Since it becomes a thin shape and small, it is suitable for loading to an automobile.

[Translation done.]

* NOTICES *

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] It is the block diagram of the collision-prevention radar in which 1 operation gestalt of this invention is shown.

[Drawing 2] It is the perspective view of the scan means part of the collision-prevention radar of this invention.

[Drawing 3] It is the explanatory view of the scan means of the collision-prevention radar of this invention of operation.

[Drawing 4] It is the block diagram of the collision-prevention radar of

the conventional technique.

[Description of Notations]

1 Transceiver Antenna

6a Preceding paragraph dielectric disk

6b Latter-part dielectric disk

7 Drive

[Translation done.]

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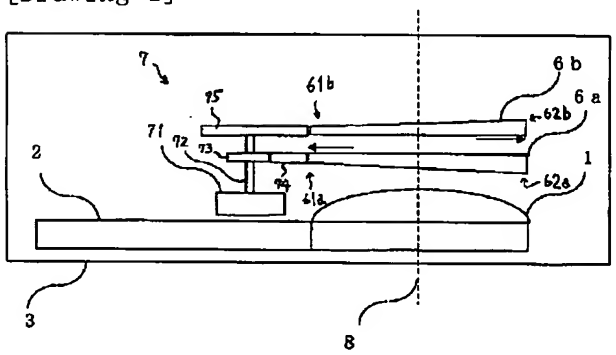
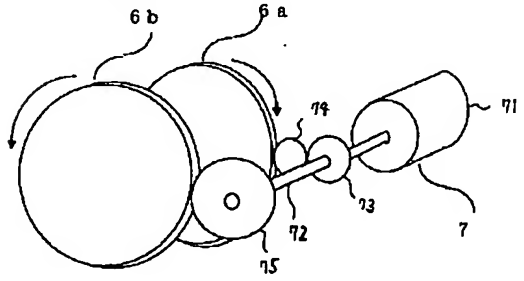
DRAWINGS

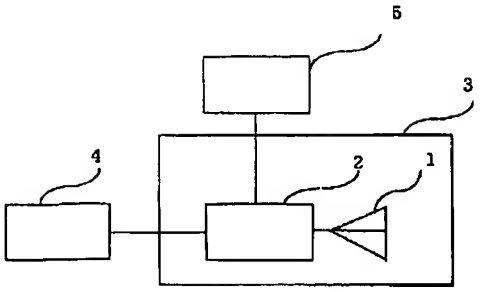
[Drawing 1]



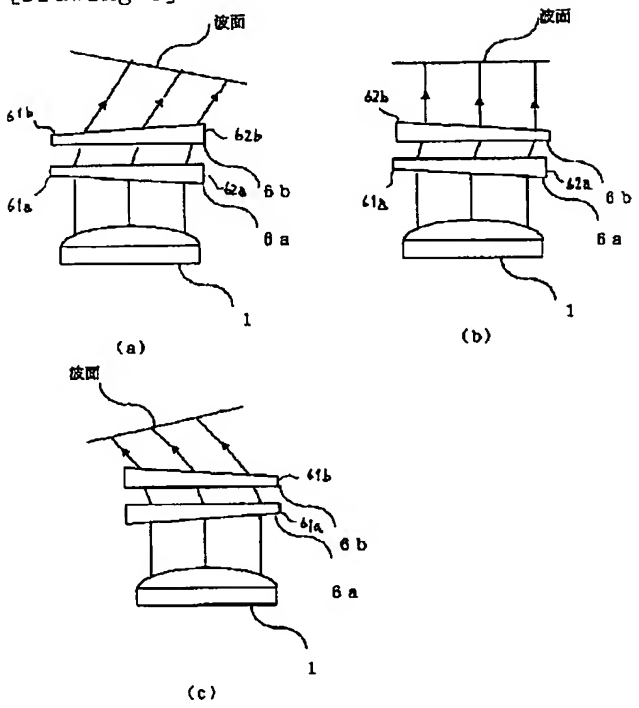
[Drawing 2]



[Drawing 4]



[Drawing 3]



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